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UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL ADJUSTMENT AGENCY

GRAZING LAND MANAGEMENT

[PART I.—Objectives and Policy. PART II.—Instructions for the Preparation and Approval of the Grazing Land Management Plan WD-66]

Part I.—OBJECTIVES AND POLICY

The objectives of the Agricultural Conservation Program for grazing land are to encourage and assist ranchers to restore and maintain their range lands in their highest productive state. This may be brought about by:

1. Bringing to the attention of operators—

a. The economic importance of the range and how its conservation and productivity affects the welfare and continued prosperity of many people, both directly and indirectly.

b. The advantages of a well managed range over a depleted range.

c. The responsibility of each operator to conserve his range resources. The successful operator never overgrazes and always has in reserve extra feed or reduces his livestock numbers when it becomes necessary to meet adverse climatic conditions.

d. The value of proper range utilization and conservation measures which might be adopted to improve the resources of grazing land.

e. The time and patience required to restore a depleted range.

2. Making available to operators:

a. The best information which can be assembled from the several branches of the Government dealing with range management, from State agricultural colleges and experiment stations, and from conservation-minded ranchers.

b. The services of qualified personnel and practical demonstrations to show how range conservation can be attained.

c. Conservation payments authorized under Soil Conservation and Domestic Allotment Act, as amended, for carrying out practices and improvements which will contribute to the resources of the range.

Grazing land management.—The primary purpose of this practice is to promote among stockmen a sound concept of grazing land use. To accomplish this, operators must first analyze their grazing operations and be prepared to adjust their livestock number to the available forage. Experience has shown that proper stocking and full use of the range at the most opportune time without injury to the forage are the basic principles of sound grazing land management. In addition, this practice involves a knowledge of the more important range plants, their density, composition, palatability, proper time of use, amount of desirable forage produced, adaptability to each kind of livestock and to the different types of climate and soil, and a practical method for measuring their utilization. Good management also involves the use of salt, stock water, and fences where practicable, advantageously located to cause a wider distribution of stock on the range and a more uniform use of the forage. Rotation grazing,

natural reseedling by deferred grazing, and artificial reseedling within limitations are sometimes used in this connection to a good advantage.

The Grazing Land Management practice, stock water developments, and other improvement practices are pointed toward restoring and improving the normal, natural cover of protective vegetation. The general goal is to increase not only the quantity but also the quality of vegetation. An improvement in the forage stand increases the volume of forage available for grazing, retards run-off, and permits more of the precipitation to enter the ground, which in turn contributes to plant growth and arrests accelerated water and wind erosion. Vegetation left on the ground, as it dies and decays, increases soil fertility.

The payment for any practice is not intended to cover its full cost; the Government payment does serve, however, to lessen the expense to operators who are willing to contribute some of their own time and money toward performing one or more of the practices offered in the program. Each committeeman, member of the State office, and everyone connected with administration of the program, should handle his part of the work so that the range land in the future will be in a better condition as a result of the program.

Constructive conservation practices are actually an improvement to the land and should be thought of as permanent investments. The expenditure of public funds on such improvements can be justified only when a public benefit results through diminution of soil and water losses. All range and pasture practices require prior approval of each individual project before the practice is undertaken. They must be performed in a workmanlike manner and conform to approved specifications which gives assurance that desirable conservation will be attained. Prior approval should be given only when the practice will result in the conservation of soil, water, or forage resources.

In order to permit a reasonable exercise of judgment to county committees in meeting varying local conditions and best applying the program provisions to their own localities, the following suggestions should be regarded as a general guide in granting prior approval and not as specific instructions for interpreting practice requirements:

Erosion and run-off control.—Erosion control practices are generally not needed on ranges having a good cover of perennial grass sod, but often because of improper use in past years resulting in loss of protective vegetative ground cover, erosion has started that will greatly delay the restoration of the grass stand unless mechanical aids are constructed.

One distinctive characteristic of the western range area is a low normal rainfall which, however, frequently comes in the form of quick flashy rains. Moisture falling on a parched, barren soil, often with a considerable slope, quickly drains into the arroyos and canyons and if extended over a considerable area may develop floods that greatly damage more valuable land below.

Erosion and run-off control measures should be undertaken only after full consideration of the elements involved, both on the watershed above and below the proposed structures.

CONTOUR FURROWING, LISTING, OR SUBSOILING: These practices are adapted to soils and locations that allow a considerable part of the normal rainfall to run off because of tight impervious soils or because

of innumerable small gullies that serve as channels which hasten the run-off before the soil has had time to absorb it. This practice should begin at the head of the drainage and be extended on the contour as far as possible down the slope, thus making effective the project as far as completed.

Wisely planned and well executed control devices near the headwaters of these destructive flood channels are of national interest, but slipshod engineering and construction can result in new erosion and soil loss.

SPREADER DAMS AND TERRACES: These practices, like contouring, should be initiated as high up on the watershed as possible. Unless the area below the terrace outlets is relatively flat, with considerable depth of soil capable of storing the additional moisture, this practice should not be approved.

A series of projects on the same watershed may be necessary to keep the run-off out of the established flood channels long enough to give the cut banks an opportunity to heal. In every instance the upper project should be completed before beginning the next one, working down the watershed step by step.

Development of stock water.—Water development has a range betterment value only if it is done on locations where livestock water is needed and where additional developments will accomplish better distribution of the livestock and more equal utilization of the forage crop, thereby relieving concentration and overgrazing around limited existing waters. For these reasons none of the water development practices should be approved at any ranch headquarters (or sub-headquarters) or in any locality where overgrazing is in evidence and where additional waters would further aggravate the situation by inducing additional concentration.

EARTHEN TANKS OR RESERVOIRS: These are used mainly in localities where live streams or springs are lacking and where the underground water level is too deep to be developed economically. They are constructed at suitable locations in arroyos and canyons for impounding flood waters or run-off from snow. In wide open spaces where an earthen dam would not be practicable, run-off or underground water might be concentrated in an earthen pit for livestock. There are many disadvantages and ordinarily they are only used where other means of supplying water are not available. A suitable site must be picked for the location; filling depends on the uncertain precipitation of the season and there is the further risk of cloudbursts washing them out. Since most of the States have State laws imposing varying degrees of restrictions and special requirements, it is essential that specifications be secured or prepared for each State, and that they be thoroughly understood all along the line by committees, ranchers, compliance supervisors, and others concerned.

CONCRETE OR RUBBLE MASONRY DAMS: Concrete or rubble masonry dams are ordinarily built in narrow canyons with steep rock walls, where bedrock is near the surface. Scarcity of dirt and spillway problems are often influencing factors in deciding on this type of dam. Since each location presents a special problem different from any other, individual specifications should be prepared for each project by an engineer.

WELLS: Because mechanical devices are necessary and must be kept in operation to make wells effective, wells are recommended only for places where other types of water development are not feasible.

SPRINGS: Advantage should be taken of any natural watering place which will provide an adequate supply of water for livestock at the time it is most needed. If troughs or storage space are necessary they should be located out of a draw or arroyo to prevent washing out.

Part II.—INSTRUCTIONS FOR THE PREPARATION AND APPROVAL OF THE GRAZING LAND MANAGEMENT PLAN, WD-66

The Grazing Land Management Plan, Form WD-66, will be completed in duplicate and used to record pertinent facts as a basis for analysis of a ranching operation by the operator and the county committee. The original will be filed in the county office while the copy will be retained by the operator. WD-66 is of little value to any one but the operator. Unless he is interested enough in range management to accurately record the information for his own analysis the county committee can be of little help to him and he should not be encouraged to continue with the Grazing Land Management practice. Forage resources are balanced against the livestock to be carried on the unit during the program year and must be expressed in comparable terms. No plan should be approved which is likely to result in overgrazing. When such conditions are encountered, the county committee should suggest more conservative stocking rates, different seasons of use, or other improvement or management practices which will contribute to conservation and make the plan acceptable. Only when their suggestions have been refused should the plan be rejected.

Section 1A.—In this section are recorded the acreage and relative value of different classes of grazing land on the unit expressed as AUM (animal unit month/s), which is the amount of forage required to furnish the nutritional requirements of an average weight mature cow for one month. Controlled grazing land includes only the grazing land eligible for payments under the ACP Program. The aftermath of mountain meadow hay land listed on line 2 must include only that acreage previously classified as mountain meadow since this acreage combined with the acreage of eligible grazing land entered on line 1 will be the acreage used to compute the maximum payment that may be earned for performing management or improvement practices in connection with grazing land management. The AUM should be established in line with the productivity of the meadow. The average value of meadow aftermath is 0.5 of an animal month of feed per acre. County committees, with approval from the State committee, should revise these factors when definite evidence justifies such changes. Other grazing lands listed on line 3 should include only the grazing land not eligible for payment computation that is intermingled with or adjacent to the eligible lands and is not administered by permit or grazing allotment. Lands included in this category are privately owned lands not leased, Federal lands leased under Section 15 of the Taylor Grazing Act, etc. The animal unit months grazing capacity when not established by a standard survey can be computed by assigning a grazing capacity similar to surveyed capacities made on comparable adjacent lands.

The number of animal unit months of grazing capacity for the other grazing resources such as croplands seeded to permanent or temporary

pastures, aftermath grazing on alfalfa or other tame hay, tame or wild hay land diverted to pasture, Forest or Grazing Service allotments, stubble or corn pasture, and other crop residue used for pasture should be determined by multiplying the number of AUE (animal unit equivalent/s) by the number of months such pasture, field, or allotment is used. To illustrate, an operator has a grazing service allotment for 100 cattle for 6 months. Actually, he turns out 100 yearlings for 4 months. $100 Y \times 0.7 = 70 \text{ AUE} \times 4 = 280 \text{ AUM}$. Or an operator plans to graze 200 cows and calves on wheat stubble for 2 months. $200 Cs \times 1.2 = 240 \text{ AUE} \times 2 = 480 \text{ AUM}$.

Section 1B.—Here is recorded the tonnage of various supplemental roughages that are available and which will be fed as part of the operation during the program year. One ton of ordinary alfalfa hay will feed a mature cow 2 months, therefore, a conversion factor of 2 should be used to convert tonnage to animal unit months. Meadow hay of good quality and fine leafy alfalfa have a value of 3 cow months of feed per ton. The relative feed value for other types of supplemental roughage, such as grain hay, ensilage, etc., should be converted to animal unit months on the basis of quality, method of feeding, etc. Concentrates, such as grain or oil cake, do not replace range forage and therefore do not prevent overgrazing. Credit for a concentrate should be allowed only when used in connection with forage or roughages other than range. The credit allowed should not be in excess of the actual roughage replaced. For instance, if an operator claims that one ton of hay and 120 pounds of oil cake will feed a grown animal 4 months, the ton of hay plus the 120 pounds of concentrate should be given a combined credit of 4 AUM.

The use of Section 1B is optional with the State committee and need not be used in areas or on individual ranches where the feeding period and the grazing can be segregated. When supplemental feeds are not recorded the livestock inventory in Section 2 must be computed on the number of months such livestock will be grazed in order that county committees may have a relative picture of the feed resources and livestock requirements.

Section 2.—The consumption of forage by different classes of livestock has a close relationship to the body weight of the animal. Animal unit equivalents (AUE) therefore, are used to place all classes and ages of stock on a comparable basis. The number of stock of a certain class and age multiplied by the AUE and by the months of the program year they are to be on the unit gives AUM of feed necessary to make desirable weight gains. The additional line under each class and age of livestock has been provided to make entries for sales or purchases of livestock during the program year. If more than two lines are needed for classes of livestock not recorded, such as colts, goats, etc., entries may be made on the blank lines at the bottom of the section or on any lines in this section not used by deleting the printed class and AUE and entering the applicable data.

In determining the age and applicable AUE, stock are classified as yearlings when past 6 months of age but under 18 months. Stock under 6 months will be considered calves, lambs, or colts according to their class. Cattle 18 months old or more are considered a unit and indicated by the symbol C. Cows with calves at side have an AUE of 1.2 and are shown by the symbol Cs; yearling cattle AUE 0.7, symbol Y; sheep over 6 months old, AUE 0.2, symbol S; ewe and lamb at

side, AUE 0.25, symbol Ss; lambs under 6 months of age, AUE 0.05, symbol Sy; horses over 6 months of age, AUE (according to weight) 1.0 to 1.4, symbol H; colts under 6 months, AUE 0.7, symbol Hy. The ages of all animals are taken as of January 1 of the applicable program year except calves, lambs, or colts. These should be counted as of July 1.

Section 3.—List all range improvements and practices with which the operator requests assistance through the Agricultural Conservation Program. Make entries in the respective columns as follows:

Column a.—The symbol for the practice or improvement as listed in the State Handbook.

Column b.—The name or description and the extent of the practice, such as "Fence—360 rods," "Storage tank—15,000 gal.," "Dam—4,000 cu. yds.," etc.

It is suggested that the improvement practices be recorded in comparable groups, listing in one group those practices for which payment cannot exceed 2¢ times the eligible grazing land and mountain meadow land, in another group record those practices for which payment cannot exceed the maximum allowable for practicing grazing land management and in another list those practices that do not have any payment limit other than the limit established by the county committee.

Column c.—Under location, give legal description as SW¼ Sec. 18 Twp. and Rge. or, if unsurveyed, the distance and direction from a recognized landmark.

Column d.—The initials of the county committeeman who reviews the request and approves or disapproves the practice. The signature of a committeeman approving the entire management plan does not constitute prior approval of the practices in Section 3. Each practice must be considered separately and initialed. If the project is not approved, write "disapproved" in Columns f and g.

Column e.—The date action was taken.

Column f.—The units (acres, rods, cubic feet, etc.), completed for payment. Entries in this column should not be made until performance is reported. Do not record any units not eligible for payment. For example: An operator requests prior approval for the construction of 1½ miles of standard fence representing two or more projects. Actually, 200 rods were built to conform with the specifications approved by the county committee. 200 rods should be recorded in Column f, provided such performance represents a completed project. No payment can be made for a project not completed.

Column g.—Enter the total value of the units reported in Column f.

Section 4.—The operator, or the county committee after full discussion with the operator, should briefly outline in Section 4 contemplated shifts in management practices that are not shown in other sections of the form but would make a contribution to better management of his range land.

Section 5.—This is a detailed breakdown for recording the use of various parts of the ranching unit either by fenced pastures or use areas. When appropriate entries are made in each column, a complete summary of use is made available for each pasture or use area entered in Column a. Column a to e, inclusive, must be completed and will represent the plan of grazing agreed upon with the county committee. Make entries in the respective columns as follows:

Column a.—The name, number or any other designation the operator may use for a certain pasture or area. Land not under legal control of the operator, such as public domain, etc., when intermingled with and a part of a fenced pasture or use area grazed by the operator may be included, provided the acreage and animal months are entered on a separate line and identified as such.

Column b.—The acreage of each pasture or area recorded on the same line in Column a.

Column c.—The animal months of feed (animal units×12) produced by the entry in column a. Established grazing capacities from the records in the county office for all grazing land under the legal control of the operator will be used for setting up the AUM grazing capacity. An adjustment may be made after discussion with the operator, provided it is approved by the county committee.

Where a higher grazing capacity is assigned, the operator should understand that his stocking is in excess of the normal established for the unit and that utilization must meet the standards established by the AAA or any payment under the practice will be denied. A grazing capacity may be assigned by the county committee to intermingled land referred to above under column a, provided it is comparable to the eligible land in the same pasture.

Column d.—The season or seasons the area is expected to be grazed, such as spring, spring-fall, year long.

Column e.—The total animal months to be grazed, that is, the number of livestock times their respective animal unit equivalent times the number of months the pasture or use area will be grazed.

When the grazing management plan has been completed, reviewed, and, if necessary, revised by the operator and the community, the plan may be approved by signing of the form by one member of the committee. The signature of the operator may be required in any State where the State committee so desires.

The following columns will be completed after the close of the grazing season:

Column f.—The season of the year or actual dates the area was actually grazed.

Column g.—The total animal months the area was grazed, that is, the number of livestock times their respective animal unit equivalent times the number of months the pasture or use area will be grazed.

Forage utilization must be reported by pastures or use areas for all ranching units participating under the management practice. The primary purpose of the practice is to induce operators to plan the management of their unit on the basis of the use of forage within proper limits. Field tours should be arranged for interested operators where varying degrees of use may be observed. Group discussion of such problems will develop countless suggestions of value in making estimates of utilization. Following such field tours and discussions, operators should be encouraged to report utilization for their own units.

In most instances experienced range men can readily determine and reach agreement as to the degree of use in their local area. Perhaps they often are optimistic in their opinions relative to the resistance of native vegetation to abuse. The objective in offering the Grazing Land Management practice is to improve the utilization standards upon which their present management is based.

If operators and local committeemen making utilization determinations encounter difficulties in determining whether proper use standards have been complied with, the farmer fieldman or other State personnel, trained in making technical determinations, should be called upon to assist. Local people interested in acquainting themselves with formalized methods may find instructions in WD-68.

Where utilization is determined by visual, nontechnical methods it may be easier to think in descriptive rather than in numerical terms. Under the "Degree of Use" block on the form are provided five columns designated as (h) light, (i) moderate, (j) proper, (k) heavy, and (l) destructive. The following descriptive statements offer a few general guides that will help committeemen and supervisors recognize variable degrees of use. These guides are very general and in some cases will not fit all local problems and conditions that will be encountered. Therefore, no committeeman or supervisor should attempt to check performance or advise operators on standards of use until they have received specific training on how to check and recognize utilization.

Light utilization means that less than 25 percent of the crop by weight has been removed and from a short distance will have the appearance of not having been grazed.

Moderate utilization means that more than 25 percent and less than 45 percent of the crop has been removed. There will remain an abundance of seed stalks, patchy grazing will be evident, sufficient basal growth will remain to conceal the ground where a dense stand exists. In ranges of mixed stands some species may be grazed rather short while less palatable ones are totally ungrazed.

Proper utilization will permit from 45 to 55 percent of the crop to be grazed off. Some species are less resistant than others and often the same species are the more palatable; and under those circumstances management to maintain the present composition requires the lighter degree of use. Range falling in the proper use classification will have some seed stalks of the more palatable plants remaining, the appearance will be ragged but not quite so patchy as those in the moderate class. The narrow spaces of bare ground will be hidden when viewed from a distance of 25 feet. The crowns of all plants will be protected by stubble and basal growth. The less palatable plants will be lightly grazed.

Heavy utilization results where 55 to 70 percent of the forage growth has been removed. It will have the appearance of having been evenly grazed, few seed stalks will be left, and bare ground will be seen from a considerable distance. Plant crowns will be exposed and forage shrubs will have a hedged appearance. An erosion pavement of small stones and coarse gravel will be noticed on gentle slopes. Plants of low palatability will have been grazed to a noticeable extent.

Destructive utilization is the result when more than 70 percent of forage growth is removed. The area will appear barren, small pebbles will show at a distance, rills and gullies will be evident on sloping land. Poisonous and nonpalatable plants will have been grazed.

After observation of utilization of a pasture or use area, making sure that the area has been covered to an extent that the observer has seen a cross-section representative of the whole, the degree of utilization may be recorded by placing a check mark in the column which most closely describes the determination.

The entries in Columns m and n will record the percentage of actual use, and the percentage of proper use by utilization areas within each pasture. Instructions regarding the collection of these data will be found in WD-68, Technical Instructions for Checking Forage Utilization.

Column m.—Enter the percentage of forage residue actually used when determined by examination or as estimated.

Column n.—Enter the percentage of proper use (the percentage of forage produced on the area which can be safely grazed). (NOTE: This entry is required only where a technical examination is made and will be taken from WD-61, Supplement A.)

Column o.—Enter the acreage overgrazed. It will be necessary to explain under "Remarks" whether this acreage is around watering places or other unavoidable concentration areas.

The space provided for "Remarks" at the bottom of Section 5 should be used to record in narrative form problems encountered, unforeseen circumstances that changed the planned system of use and other pertinent facts that will be valuable to the operator when preparing subsequent management plans.

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UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL ADJUSTMENT AGENCY
WASHINGTON, D. C.

AGRICULTURAL CONSERVATION PROGRAM**WESTERN REGION**

**TECHNICAL INSTRUCTIONS FOR CHECKING FORAGE
UTILIZATION**

These instructions outline the policy, procedure, and methods to be used in training supervisors and range examiners to measure and recognize degrees of range utilization and to establish standards of use that will be acceptable for practice payments on range land in the Agricultural Conservation Program. Through experience an operator or trained supervisor can determine by observation a properly utilized range or one that is badly overgrazed. The methods outlined herein have been developed for use on those borderline cases where compliance is hard to determine.

I. PURPOSE OF GRAZING LAND MANAGEMENT

The grazing land management practice is designed to influence the management of range lands so as to effectuate the conservation principles of previous Range and Agricultural Conservation Programs. The basic purpose of this specific practice is to promote among stockmen a sound concept as to the proper use of range land and to develop methods by which operators may measure utilization and thereby currently adjust stocking within the productive limits of their range, and in that manner take positive steps that will restore and maintain their grazing land in the highest productive state. This type of practice, while it is the most desirable method of range conservation, presents a difficult problem of performance determination. The success of any range conservation program is dependent on proper utilization of the range forage. In order for a practice of this nature to succeed, all persons charged with its administration must be sure that proper stocking levels are maintained at all times to prevent misuse and overgrazing.

**II. PERSONNEL WHO WILL MAKE UTILIZATION DETERMINATIONS
AND ESTIMATES**

Each county, where grazing livestock is of major importance, should train and develop one or more men to measure and check range utilization. This man should be capable of identifying the principal forage species found in the county at all stages of growth and use, or should be capable of learning such identification with a minimum of outside help. He should be a person who commands the confidence and respect of ranchmen and preferably should be permanently associated with agriculture in the area so that his services will be available in future

years. In many counties, the range member of the county committee or a community committeeman would be the most desirable man. Other counties who have developed county range examiners will probably want to continue using these men for this type of work. In other areas where the amount of grazing land is small, it may be desirable to train one man to handle a group of counties. It will be necessary to work out this problem in each State in accordance with the needs of the several counties.

The State committee will be responsible for determining: (1) That capable men familiar with practical range management have been assigned to this job; (2) that adequate personnel and facilities are available for training them in utilization procedures approved by the Western Division; and (3) that the utilization standards established in any county of any State do not permit a conservation payment to be made for performance of a practice on any eligible grazing land which is overgrazed.

III. PROCEDURE IN THE FIELD

Range-utilization studies should be made as soon as possible following the end of the grazing season. All supervisors must work closely with each ranch operator so that the utilization check, as it applies to his ranching unit, may be properly explained and analyzed.

Before undertaking any detailed stubble height measurements, a preliminary or reconnaissance examination should be made for the purpose of determining (1) the extent and uniformity of utilization areas, and sketching such areas on the map; (2) the estimated percentage of utilization by areas; and (3) the major key forage species occurring in each area for which height-weight and proper use data are available.

In general, each fenced pasture or area used as a separate pasture will be a utilization area, provided there is only one forage type within the pasture and provided further that the degree of use within the pasture is relatively uniform. A utilization area should not include more than one forage type. Changes in vegetative types will automatically change the key forage species that will be used when checking and measuring utilization. Definite variations in the degree of use that is caused by poor distribution and management will be typed separately, provided that the distribution and use can be improved either by better management, adequate or additional range improvements and developments, by using proper class of livestock, by adjustment of livestock numbers, by lengthening or shortening the grazing period or by shifting the season of use. Ragged use with some areas overgrazed and other areas unused that cannot be corrected as outlined above, will be handled as one utilization area. Do not attempt to break pasture units into numerous small utilization areas beyond the limits of practical range management.

The number of utilization areas for which stubble-height measurements will be made are limited to areas and ranching units that are grazed relatively close to proper use standards. Estimated degrees of utilization will be used on most areas and will be expressed in the same terms as though the determinations were made by stubble measurements and the utilization gage used to determine the percentage of use.

Care must be exercised at all times when making visual estimates on degree of use. When visual estimates are being made, detailed observations and studies on small plots and frequent measurements of crop heights should be made in order that the actual percent utilization can be recognized. Estimators making casual observations of general range conditions frequently overlook closely grazed desirable forage plants and will not detect changes in the volume of forage production. A minimum of one course per ranch or two courses a day should be measured in order that estimated and measured determinations be comparable.

One reconnaissance estimate may be made for the group of key forage plants on the area or separate estimates may be made for each key forage species. The actual and proper use computed for all estimated areas will be as follows: Select the key forage plants, make an estimate in terms of percent of their relative occurrence or composition, multiply the percent composition by the estimated use or proper use, whichever is applicable, for the species. For example: Take four key forage plants. Plant "A" represents 50 percent of the composition with estimated use of 40 percent and a resistance factor of 50; plant "B" 30 percent with estimated use of 50 percent and a resistance factor of 40; and plants "C" and "D" 10 percent each, with estimated use and a resistance factor of 30 and 45 for "C" and 25 and 55 for "D".

Plants:	Actual use	Proper use
"A"-----	50 x 40=20.00	50 x 50=25.00
"B"-----	30 x 50=15.00	30 x 40=12.00
"C"-----	10 x 30= 3.00	10 x 45= 4.50
"D"-----	10 x 25= 2.50	10 x 55= 5.50
TOTAL:		
Weighted actual use for the area (percent)-----	40.50	
Weighted forage resistance for the area (percent)-----	47.00	

Resistance factors used in this method represent the maximum weight a forage plant can be taken and still sustain the plant in a normal productive state. This factor does not conform with the Proper Use Factors or Palatability Tables used in making grazing surveys. The grazing survey palatability tables take into consideration the relative desirability of each species correlated with other plants and, in general, are expressed in height percentages, while the resistance factors for utilization studies reflect a definite percentage of weight that should be taken from a specific species regardless of the relative desirability.

IV. DETAILED INSTRUCTIONS FOR MAKING STUBBLE HEIGHT MEASUREMENTS

Stubble height measurements will be used to train supervisors on the variable degree of utilization, as a guide or yardstick to keep estimates of the various supervisors comparable, and for accurate determination of the borderline cases where definite compliance determinations are needed. Supervisors will, through the training period, be required to make several area measurements that can be eliminated as the estimator develops, through training and practical application, an ability to make accurate estimates.

A. Method.—On perennial grass ranges the stubble height measurement method will be used. These height measurements are converted

into total weight of the forage crop taken by use of a semi-logarithmic utilization gage equipped with cards showing in percentages the weight distribution by plant height for specific key forage species. These cards are prepared for each State, showing in general the key forage species occurring in that State for which height-weight relationship data have been developed.

B. Selection of areas to be measured and key species.—The supervisors will, on the preliminary inspection, have the boundaries of each utilization area located on the map with a minimum of one and a maximum of four key forage species identified for the area. The number of different kinds of forage plants encountered will determine the number of key forage species to be measured. The supervisor will make stubble height measurements of the key forage species for those areas for which the visual estimated percent of utilization is within 10% under or 10% over the weighted forage resistance for the area. Areas that are obviously over or obviously under utilized need not be measured. Key forage species selected for measurement will be the more desirable plants found in the area that should be restored or maintained even though such species represent a small amount of the total forage now produced.

C. Method of sampling.—A line transect course with random selection of plants to be measured will be used to avoid any personal or biased measurements. The supervisor will select a route along a straight line through the area which represents, as nearly as can be determined, the average grazing use. When a course has been selected, the supervisor will pace in a straight line toward a selected object on the horizon, selecting and measuring at equal intervals one sample plant of one of the predetermined species. In order to insure an absolute random selection of plants, measure the nearest plant encountered at the end of each predetermined interval. Do not measure seedlings, plants too small to be used by the class of livestock using the area, and plants not readily available for grazing that are protected by cactus, brush, rocks, or other objects. In determining proper range use the availability of the forage is a very important factor. As the intensity of grazing increases, the livestock will be forced to graze farther into the brush, cactus clumps, etc. This will result in overuse and abuse to the open readily available areas and will promote range depletion. In order to obtain true conservation all studies must be confined to that part of the forage crop readily available for grazing.

D. Intensity of sampling.—On any area a minimum of 30 plants of various species or 20 plants of one species should be measured. This will, on a relatively evenly grazed range, give a fair sample. On unevenly grazed ranges additional samples should be taken as a 20-plant sample will be very inadequate. When measuring plants on an area sufficient samples should be taken to give a fair average of the grazing use. A supervisor should compare the percentage use determined by measurement with his preliminary estimated use. When these vary considerably another course should be run through the area to determine whether the measurements or the estimate is in error. This procedure will also help develop a high degree of accuracy in estimating degrees of use.

E. Rules governing all plant measurements.—When measuring a plant, always place the rule in the center of the bunch or turf circle, rather than along the side. The rule should not be forced down into the crown, but should be placed firmly on the cushioned portion of the plant.

1. Ungrazed plants.—For seedstalk-producing plants, measure the tallest seedstalk to the nearest inch. For nonseedstalk-producing (culmless) plants, measure the tallest leaf to the nearest one-half inch. Leaf height measurements will always be made on sedges since these plants do not produce prominent seedstalks. As a general rule, seedstalk measurements will be made on all grasses unless due to drought or other reasons, no seedstalks were produced. (Note.—Be sure that culmless tables are available for the species before attempting to use leaf height measurements to determine the average crop height.) Measurements recorded for ungrazed plants must not be average heights, but will be the tallest seedstalks or leaf height found on the plant. Measurements for ungrazed plants are used to determine the average ungrazed height or crop height for the species on the area. When possible ungrazed plant height measurement should be made at each station for the species encountered. It will be necessary to go off the course and make the necessary ungrazed height measurements for each grazed plant encountered. Adequate measurements off the course will more accurately reflect average crop heights due to height variations occurring along the course in moist swales, rocky slopes, north and south exposures, etc. Place a zero in column 3 of Form WD-61 for all ungrazed plants encountered on the course in order that the lack of utilization of these plants be given the proper ratio in computing the degree of use on the area. On heavily grazed areas, it may be necessary to secure ungrazed plant heights from temporary enclosures or from partially grazed plants that retain the tall center seedstalks. In such cases a minimum of 10 plants should be measured.

2. Grazed plants.—Measure to the nearest one-fourth-inch stubble height measurements for all grazed plants.

- (a) Any measurement less than one-fourth inch will be recorded as zero.
- (b) All stubble height measurement of unevenly grazed plants will, when possible, be averaged to the nearest one-fourth inch.

When difficulty is encountered in averaging the varying stubble, divide the plant into equal segments of easily averaged stubble heights. Measure each part as a single plant and record separately in column 2 of Form WD-61 and bracket all recordings for a single plant. The percentage utilization will be determined from the utilization gage for each measurement and averaged to determine the utilization percentage which will be recorded in column 3 of Form WD-61 for the plant as a whole. Totally ungrazed portions of a partially grazed plant shall not be measured as zero percent utilization will be computed for that segment of the plant. For example: A plant divides itself into four equal segments with varying stubble heights of 1 inch, 3 inches, 10 inches, and one-fourth of the plant ungrazed. The comparable percent of utilization for these measurements are 90, 60, 10, and 0, or 160 divided by 4 equals 40, the proper average to be recorded for the plant.

For regrowth the original stubble height and the regrowth stubble or regrowth leaf height measurements will be made. The percentage utilization will be computed the same as partially or unevenly grazed plants, except that the percentage weight allowed the original stubble and the regrowth stubble will be decided on the degree or amount of regrowth found on the plant. Any regrowth found on a grazed plant will always be measured as stubble height whether the regrowth has been grazed or not. The actual percent the forage crop has been utilized can best be determined by measuring the regrowth as stubble. Plants grazed once in the early spring will make considerable regrowth while plants grazed late in the season will generally not make any regrowth.

F. Use of Form WD-61, Report of Forage Utilization by Species—Field form.—Form WD-61 will be used to record all plant measurements made. One form will be used for each utilization area measured. There will be times when measurements for two or more areas with comparable degrees of use can be recorded on one form and

computed as one utilization area for the ranch. This will be especially applicable when two or more small overgrazed areas (in fence corners and around watering places) are encountered on the unit. The form is devised to record measurements for four plants which should, for most areas, be adequate. The number of plants selected for the area should be limited to those of major importance. The measurement of several species will tend to complicate the utilization computation, will require several additional plant measurements and will add very little to the accuracy of the determination.

Instructions for use.—Column (1) "Ungrazed height:" Enter in this column either the seedstalk or leaf measurements of all ungrazed plants measured on the area. Do not record both seedstalk and leaf height measurements for a specie. Since this entry is used to determine the average crop height measurements must be either all seedstalk or leaf height, whichever is applicable. When an ungrazed plant without seedstalk is encountered on the course, step to the side and measure the nearest seedstalk on an ungrazed plant.

Column (2) "Stubble height": Enter in this column the measurement of all grazed plants encountered on the course in accordance with instructions described in paragraph E, item 2. Column (3) "Percent utilization": Instructions regarding the entries to be made in this column will be explained in item (4) of the next paragraph, "Instructions for use of the utilization gage."

All ungrazed height measurements recorded in column (1) will be totaled and divided by the total number of ungrazed plants measured to determine the average crop height for the species. Instructions for use of the average crop height will be described in item (3) of the next paragraph.

G. Instructions for use of the utilization gage.—(1) Pull the card out of the case until the scale for the species concerned appears in the window. (2) Adjust "0" (zero) on the slide to coincide with "0" on the case. (3) Turn the dial until the average ungrazed crop height determined for the species appears opposite the arrow so designated. (4) Read directly the percent utilization for each stubble height measurement recorded for the species in column (2) of WD-61. *Do not attempt to use average stubble heights for the area as your answer will be in error.* Percent utilization determination from the utilization gage will be entered in column (3) of Form WD-61. The percent utilization for each measurement will be totaled. Divide this result by the total number of entries made in column (3). This represents the total number of plants encountered or measured *on the course*. The result will be the actual percent utilization of the species for the utilization area. The actual percent of the plant that has been utilized is compared with the resistance factor for the species to determine the percentage of under, proper, or overutilization.

When the actual stocking rate is known, the following formula may be used to convert the percentage-use determination into proper stocking rates: (1) Divide the actual-use percentage by the weighted proper use for the area. The result is the percentage of the available forage crop used considering proper use as 100 percent. (2) Divide the animal months grazed by the result obtained in (1) above. The result is the approximate number of animal unit months proper stocking for the area. For example: 200 animal unit months have been grazed on an area. The actual percentage use determination is 60 percent and the proper use is 48 percent.

$$\frac{\text{Actual use—60}}{\text{Proper use—48}} = 125 \text{ percent of proper use}$$

$$\frac{\text{Animal unit months grazed—200}}{\text{Percent proper use—125}} = 160 \text{ animal unit months approximate proper stocking rate}$$

According to the formula, this area has been overstocked by approximately 40 animal unit months. Reverse the procedure and assume that the actual use is 48 percent and the proper use is 60 percent.

$$\frac{48}{60} = 80 \quad \frac{200}{80} = 250 \quad \text{Approximate stocking rate}$$

Accordingly, this area has been understocked by approximately 50 animal unit months. The formula as illustrated here can only be used in general terms since the accuracy of applying this formula depends entirely on the degree of accuracy attained in measuring the percentage use for the area. The main value is to indicate in general terms the approximate stocking rate for an area in any one grazing season.

H. Instructions for the use of WD-61, Supplement A.—This form will be used to summarize the data for each utilization area reported by the range-compliance supervisor on Form WD-61 and may also be used to record estimates of degrees of use in those areas where stubble height measurements are not made. This form is prepared to summarize the field data for 8 utilization areas. Detailed explanation of entries are as follows:

1. Enter the proper abbreviation for the major key forage species encountered on the area. (NOTE.—Key forage plants used should generally not exceed four species.)
2. Enter the percent composition the species is of all species sampled on the area. This will be the relative amount each species contributes to the total forage production and should be estimated in terms of percent.
3. Enter average percent utilization determined or estimated for the species.
4. Result of entry in (2) multiplied by entry in (3).
5. Total percent composition of all species in the areas as listed in item (2). If expressed as a percentage, this entry should be 100.
6. Total of entries in (4).
7. Enter the result obtained by dividing the entry in (6) by the entry in (5) carried to the nearest tenth.
8. Enter the species proper use percent, which is the percentage by weight that the specific species recorded in (1) may be taken without injury to the plant. (NOTE.—Proper use percentage or resistance factors will be furnished each State office.)
9. Enter the result obtained by multiplying the entry in (2) by the entry in (8).
10. Total of entries in (9).
11. Enter the result obtained by dividing (10) by (5).
12. Enter average percent utilization recorded in (7).
13. Enter average proper use percent recorded in (11).
14. Enter the surface acres in the utilization area.
15. Enter the acreage overgrazed. If the percent entered in (12) is larger than that in (13) all or part of the area must be considered overgrazed.

(NOTE.—In measuring stubble of certain species, it has been observed that those plants which have been grazed are often grazed below the level at which proper use for that species is established even though the percentage of plants grazed is very low.) It is, therefore, necessary to adequately sample the area to establish a ratio of grazed and ungrazed plants actually representative of the area. Regardless of the relationship between the entries in (12) and (13) an element of judgment must be exercised by the supervisor. The entry in (12) may be substantially less than that in (13) but an analysis of the write-up on Form WD-61 may show a series of ten or more consecutive samples where the actual utilization exceeded proper, if this condition can be corrected by management (different season of use or class of stock, salting practices, or water, etc.) the supervisor should show the proportionate acreage as overgrazed. In other cases the entry in item (12) may exceed that in (13) but the judgment of the supervisor indicates that only part of the total was overgrazed. If a series of consecutive samples on Form WD-61 show utilization at a level below proper the

supervisor may work out from this data the ratio of the area overgrazed without going back and taking additional stubble measurements as two utilization areas. This modification is designed to develop a procedure that will allow utilization areas, under this practice, to coincide with separate fenced areas within the ranching unit.

It is realized that the method of checking range utilization as prescribed herein is not perfect. Various adjustments and refinements will need to be made in the percentage weight distribution and proper use factors for States and areas. All changes and adjustments to be made will be subject to the approval of the Range Research Division of the United States Forest Service. All State and county personnel assigned to the responsibility of working with and administering the grazing land management practice will work directly with the designated Forest Service people as they, through years of research work and cooperation, have made this practice possible. While a practical method of determining performance is essential and important, care must be exercised at all times by the examiners to see that they do not become so involved in the complicated matter of checking utilization that the problems and benefits of proper management as a practice are overlooked. Making the grazing land management practice effective presents a challenge not only to the persons charged with the administration of the program, but to livestock operators as well.

